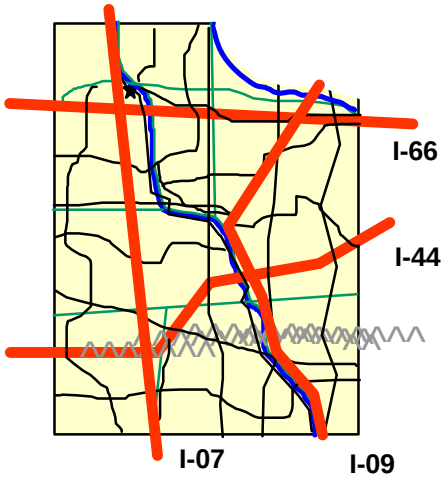
2. Midland

UNDERSTANDING ITS/CVO TECHNOLOGY APPLICATIONS

Student Manual

MODULE 2 - THE FACTS ABOUT MIDLAND (CASE STUDY)



US Dept of Transportation

Learning Objectives

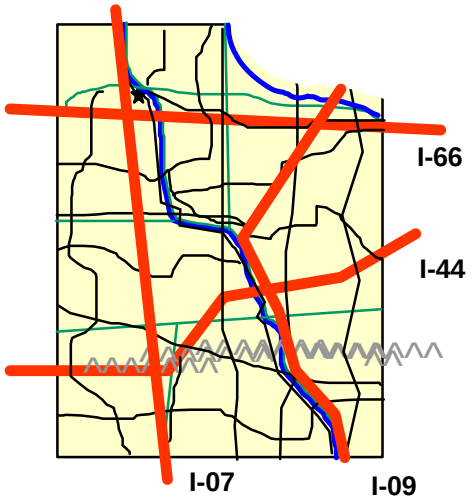
You will be able to:

- Characterize Midland/your state
- Identify possible ITS/CVO technology applications in Midland/your state
- Identify alternatives for ITS/CVO technology choices

Module Structure

- Midland Case Study
- What technologies might help Midland/your state?
- Which technologies are “best” for Midland/your state?
- Questions & Recap

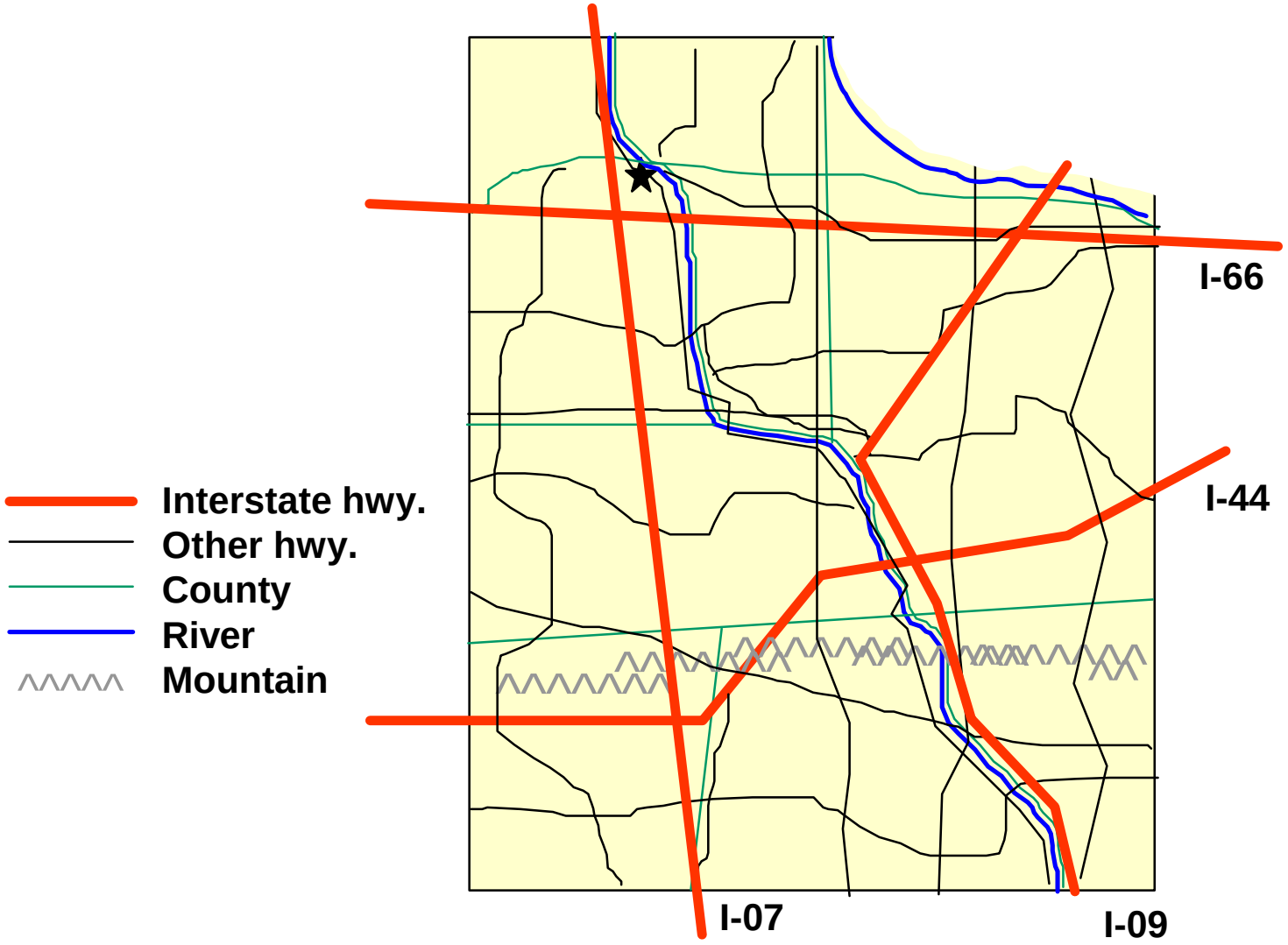
MIDLAND CASE STUDY



Why Use a Case Study?

- Diverse audience
- Provides common reference point
- Provides a means to illustrate ITS/CVO applications to solve common CVO-related issues
- Utilized throughout remaining modules

The State of Midland: General Information



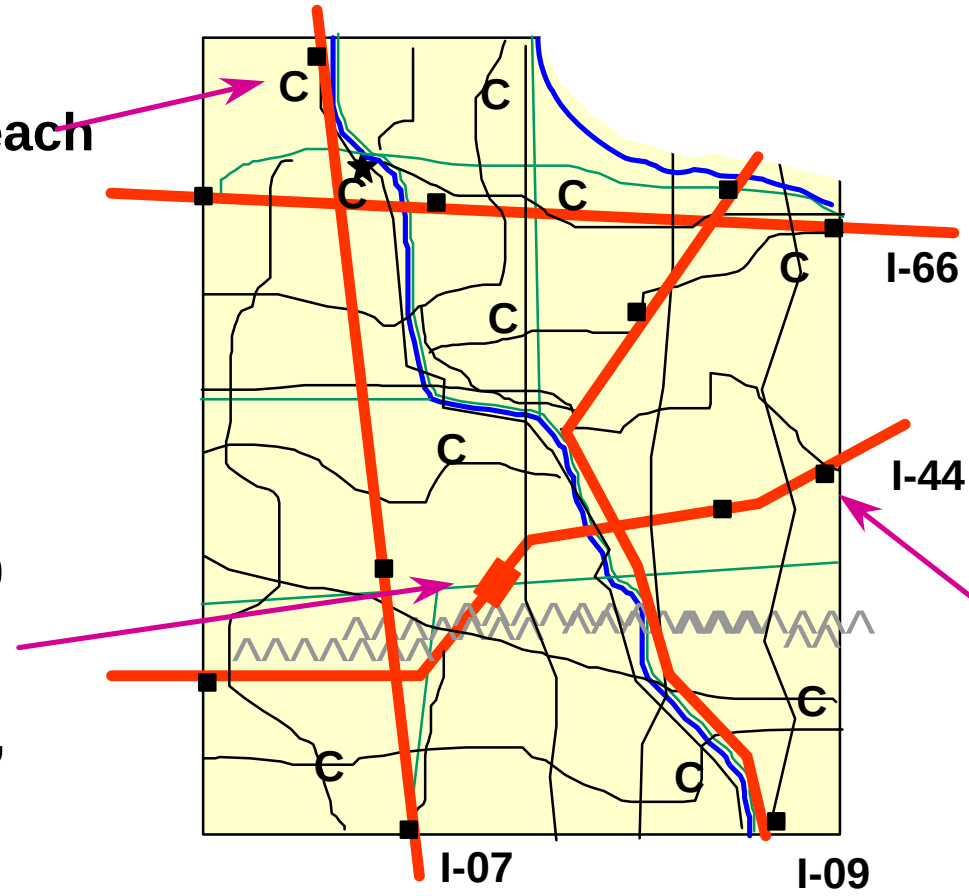
The State of Midland: General Information

- Capital: Midburg
- Population: ~ 8 million
- Topography: Gray Mountains spine runs across the state, West to East; otherwise, generally rolling plain. The Muddy River (runs NW to SE) and the Clear River (runs West to East across top of the state; part of this river forms state boundary). Rivers are navigable to large boat traffic
- Climate: Variable, with wide fluctuations in seasonal temperatures
- Principal Industries: Manufacturing, food & agriculture
- Counties: 10
- Total area: ~ 45,000 sq. miles

Commercial Vehicle Operations In Midland Today

Credentialing facilities (C) in each county

20% of all Commercial Vehicle crashes occur on one 20 mile stretch, known as "Scrunch Alley"

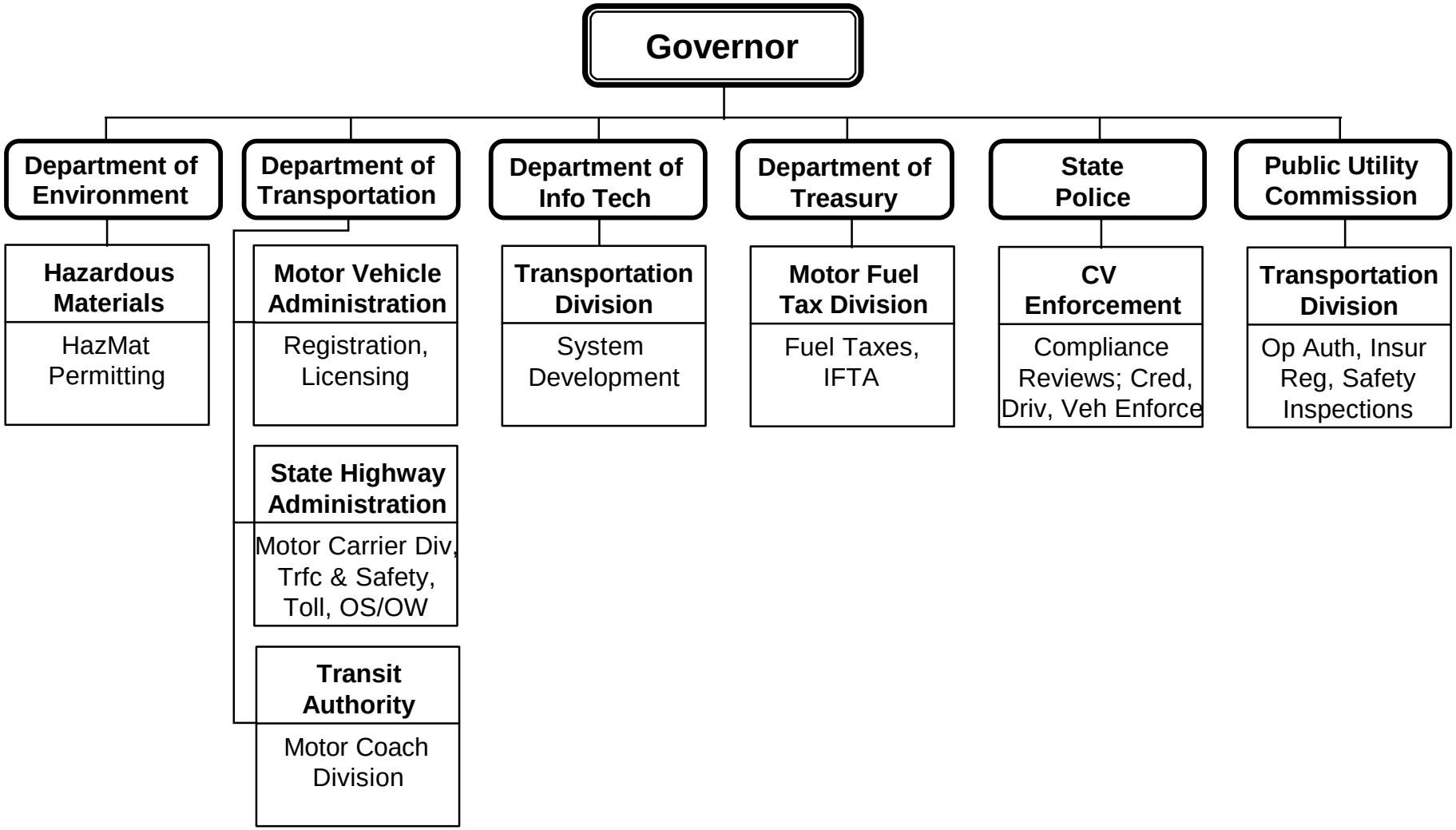


12 fixed inspection and weigh stations

Commercial Vehicle Operations In Midland Today

- Truck vehicle miles traveled (VMT) in 1994 ~ 6 billion
- No electronic screening capabilities
- Fixed inspection sites also weigh vehicles
- All credentials required for commercial vehicle operations must be applied for in person at the county-based credentialing facilities
- 1994 safety enforcement:
  - ~420 on-site (compliance & educational/safety) reviews in 1994;
  - ~59,000 inspections
- As part of a state-wide information technology initiative, state CV administrative systems and networks are being upgraded to exchange more information electronically
- Most agencies have already computerized their operations to some extent due to the initiative
- Inspection offices have radio communications to check on current status and past performance records

State Agencies and Organizational Issues

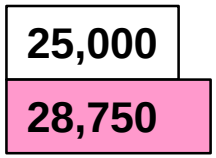


State Agencies and Organizational Issues

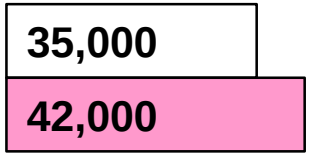
- Some agencies have a history of working well together (State Police and Public Utility Commission (PUC); Department of Environment and DOT)
- Other agencies have little experience in working together (all other combinations)
- Recent RIFs have left many agencies short-handed
- The governor is a former Midland industrialist, and is familiar with many transportation issues
- State Police perform compliance reviews, and enforce credentials, driver and vehicle regulations on the roadways
- The PUC's Transportation Division is responsible for safety inspections (driver and vehicle)
- Different agencies and administrations within agencies are involved with credentialing, as shown

Midland is growing in every CVO dimension

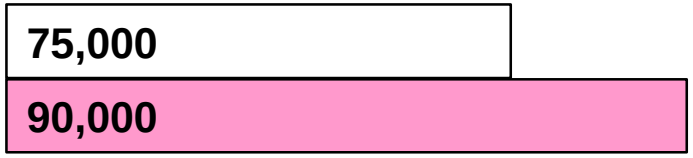
Interstate Commercial Vehicles based in Midland



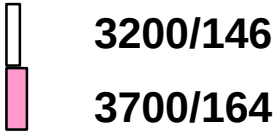
Intrastate CVs based in Midland

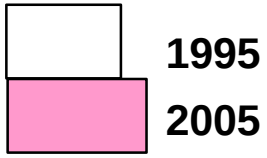


CV Drivers licensed in Midland



Injury/Fatal Accidents per year involving large trucks

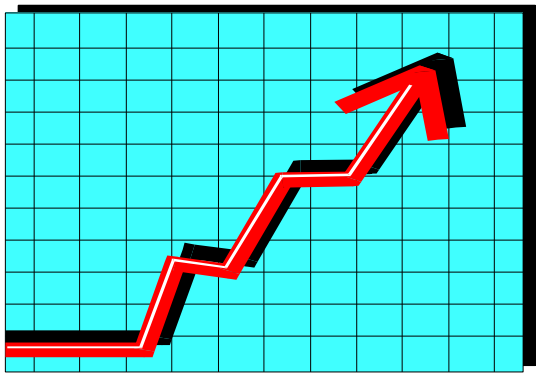




Growth in Midland

- Midland's economic growth comes from its two main industries: Manufacturing and agriculture/food

- For example, widgets for communication systems are made at plants in the northern part of the state and shipped south to communication systems manufacturers



- Dairy and soybean farms in southwestern Midland ship goods throughout the state and across state lines to neighbors to the north and east

Midland's CVO-Related Issues

- Safety Assurance
- Credentials Administration
- Screening
- Carrier Operations

Midland's CVO-Related Issues

- Safety Assurance
  - CV safety performance
  - Access to safety performance data
  - Regulatory compliance
  - Inspections
- Credentials Administration
  - Credentialing for commercial and motor coach carriers, vehicles, and drivers
  - Supporting base state agreements
  - Tax filing related to CV credentials
- Screening
  - Safety, weight, and credentials enforcement
- Carrier Operations
  - Fleet administration, maintenance, & management
  - Credentialing & tax reporting
  - Freight administration & management
  - HazMat

Safety assurance in Midland today - too many crashes

- A few local and interstate carriers are involved in ~30% of all the crashes in Midland
- Midland is ranked 11th in the nation with 3.5% of the fatal large truck crashes
- Study provides new insight into crash patterns in Scrunch Alley
- Aspen is used by 50% of the inspectors; want to expand

Safety assurance in Midland today

Crashes

Normally, crashes seem to be spread out fairly evenly across carriers. But Midland has found that there is a fairly small group which is involved in an inordinately high number of crashes. The vehicles are carrying a variety of goods, ranging from agricultural to manufactured products.

The number of large commercial vehicles involved in fatal crashes has been on the rise in Midland. There has been a steady increase in large truck traffic over the past few years, and a corresponding increase in fatalities. Non-fatal crashes have also increased.

Aspen

An inspection support system used on a portable computer, makes inspection reporting faster, and most inspectors want it.

Scrunch Alley

A recently completed study provides new insight about the patterns of crashes in Scrunch Alley:

- Many crashes involve trucks with poorly-balanced loads (65%)
- Many crashes occur during the first few hours of precipitation just after a long dry spell (30%)

Since so many crashes occur in this short stretch of road, Midland hopes to be able to focus efforts here to significantly improve the state-wide crash figures.

Credentials administration in Midland today - long lines, unhappy customers

- Delays when applying for credential
- Kiosks for passenger vehicle registration renewal are popular and successful
  - Small carriers are lobbying for similar improvements in service for them
  - Larger carriers want to apply for credentials from their own offices

Credentials administration in Midland today

CV Credentials in Midland include:

- Vehicle registration [interstate registration plan (IRP) or intrastate], title, oversize/overweight permit
- Carrier registration (including insurance verification and hazardous materials authority), interstate fuel tax (IFTA), HazMat permit
- Driver licensing

The typical process for credentialing today is:

1. Applicant requests paper form from state via phone; or state mails renewal form to applicant.
2. Applicant fills in entire form and submits in person at the appropriate county-based credential facility.
3. State personnel review the form in real time and ask applicant for supporting documentation, corrections, and clarification, and compute fees due.
4. Applicant pays fee via check, cash, or credit card.
5. In some cases, applicant departs with credentials (driver's license, temporary license plate, oversize/overweight permit, HazMat permit). In other cases, applicant departs with receipt, but no credential, pending further processing and checks.
6. Application information is entered into computer system in the appropriate credential office. The information is uploaded to a central site for that credential administration, and checked to see if the credential should be granted. Some checks are automated, some are manual. In most cases, the entry-check-response process takes ~5 working days.
7. If the application is approved, in most cases, credentials are printed and mailed once a week. If the application isn't approved, the applicant is contacted either by phone or mail, depending on the nature of the problem.

Credentials administration in Midland today - more business, but can't hire more employees

- The State is encouraging more carriers and vehicles to be based in Midland
- The personnel budget for commercial vehicle credentials administration is flat

Midland's credentials administration issues

- To spur new economic development, and continue the upward trends that already exist, Midland has enacted legislation that offers tax breaks to various forms of business, including shippers and carriers.

- The state budget allows for expenditures to continue the enhancement of network and computer systems, but does not allow for adding permanent staff to the administrative offices.

- Midland was among the first states to participate in the IRP (International Registration Plan) and IFTA (International Fuel Tax Agreement) base state agreements. Under these agreements, fees are collected in a single state for registration and fuel taxes, respectively. The base state pays the other states in which the vehicle (IRP) or carrier (IFTA) operates. The existing IRP and IFTA staff are struggling to keep up with the manual process of state-to-state reconciliation.

Credentials administration in Midland today - combining safety and credentials

- Credentials enforcement at the roadside is sporadic, since it takes so long to check

- Credentials continue to be issued without challenge to some carriers with bad safety records

Credentials administration in Midland today - combining safety and credentials

- Currently, weigh station staff must call drivers into the scale house to physically verify paper credentials. The result is that most vehicles through the scales are not subject to credentials verification.
- Midland would like to be able to verify credentials without requiring the driver to spend 5 minutes or more at the scale house.
- There is no easy way to check safety status for a carrier, since the credentials offices are not connected electronically to any safety database. Before Midland allows a carrier to register for IRP or IFTA, they want to ensure that the carrier's safety performance and tax payment status meets certain standards that the state is establishing.
- Midland wants to be able to electronically query a database that indicates whether the carrier is within the limits of their established performance standards.

Screening in Midland today - long lines and some avoid weigh stations

- Heavy traffic sometimes closes a few existing weigh stations
- Vehicles are increasingly using bypass routes to avoid weigh stations

Screening in Midland today

- Inspections occur at all fixed CV check sites. CV check sites also weigh vehicles using static scales.

- The weigh stations have been maintained well, but not upgraded to take advantage of technology:
  - All vehicles must pull off the highway
  - All vehicles are weighed
  - Sorting for inspection is done on the ramp based on visual factors only
  - Credentials checks are done manually if and when a vehicle is inspected

- The stations closest to the agriculture and manufacturing industries are often swamped with vehicles and must close temporarily to avoid creating roadway hazards.

- The number of OS/OW permits issued has skyrocketed as existing carriers struggle to keep up with the increased demands of those with goods to move.

- Midland's neighbors are trying to improve their roadside operations using *electronic screening:*
  - Use roadside readers and vehicle-mounted transponders to identify approaching vehicles
  - Use weigh-in-motion and automatic vehicle classification to measure critical vehicle characteristics while the vehicle is in motion.
  - To help make the pass/pull-in decision, perform quick look-ups of safety history data and credentials information available from on-line information systems

  This process helps them focus on potential problems more effectively.

- Midland's neighbors have offered to help Midland get started in their program. The state legislature has earmarked funds to start electronic screening in Midland.

Carrier operations in Midland today - more coming, more effective fleet management

- The use of technology among carriers based in Midland varies widely
- Many new carriers are coming to Midland
- Just-in-time delivery is an important facet of Midland's carrier business

Photo Courtesy of Fleet Owners Magazine

Carrier operations in Midland today

- Midland's carriers range from those owner/operators who have one vehicle and no computers, to those interstate operators who have hundreds of vehicles with a computer and navigation equipment in each one, and information technology systems departments

- With its emphasis on customer service, Midland wants to accommodate each kind of carrier with service tailored to their needs

- Just-in-time delivery requires up-to-the-minute knowledge of vehicle location, robust dispatch control, and knowledge of traffic and roadway conditions

Midland's Projected CVO Improvements

Broad Goals:

- Improve highway safety
- Streamline credentials and tax administration
- Reduce congestion costs for motor carriers
- Ensure regulatory compliance and equitable treatment

Stakeholders Cite These As Keys to Achieving the Goals:

- *Revised regulatory environment & re-engineered business practices*
- *Technology*

Recap of Midland's Issues, Grouped into Problem Areas

- Safety Assurance
  - A few carriers in 30% of all crashes
  - 11th in fatal large truck crashes
  - Scrunch Alley
  - Expand use of ASPEN
- Credentials Administration
  - Delays
  - Pressure from carriers
  - Flat personnel budget
- Screening
  - Heavy traffic sometimes closes a few weigh stations
  - More commercial vehicles using bypass routes
- Carrier Operations
  - Wide variety among carriers regarding use of technology
  - Many new carriers
  - Just-in-time deliveries

Which technologies might help Midland/your state in each problem area?

Midland's Problem Areas	**Technology Areas**													
Safety Information Exchange/Safety Assurance														
Credentials Administration														
Screening														
Carrier Operations														

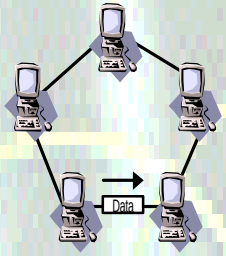
Which technologies might help Midland/your state in each problem area?

- Refer to the material just presented on Midland, or review your state's problem areas.
- Which problems might benefit from an application of technology?
- What technology might help?

Which technology applications are “best” for Midland/your state?

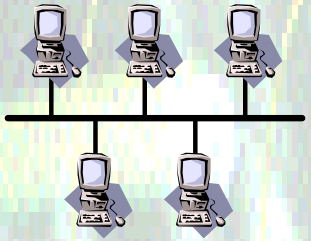
Adobe Systems

JHU/APL



A Token Ring LAN

Photo courtesy of Adobe Systems



An Ethernet LAN

JHU/APL

Which technology applications are “best” for Midland/your state?

A process for evaluating alternatives:

- Characterize the problem
- Identify possible solutions and determine performance criteria
- Define pros/cons, risks/costs of each solution
- Use one or more approaches to assess alternative solutions; some candidates:
  - literature search
  - trade study
  - competition
  - seek expert judgment
  - simulation
  - prototyping
- Evaluate
- Refine

The approaches:
Literature study or Asking experts

- **A literature study** involves reviewing published information about alternative solutions
- **Asking experts** involves soliciting advice from experts in the field. Often, site visits are part of the learning experience
- These methods are used when you have limited knowledge or experience with the proposed solutions

The approaches:
Literature study or Asking experts

- These approaches are often paired with the others listed to provide background on the technologies, lifecycle costs, and lessons learned from others' experiences

The approaches: **Trade Study**
What is a trade study and why do one?

- **A trade study is** a formal evaluation of alternative existing products
- Evaluation criteria are established in advance. For each product, the evaluator examines the features of the product, the advantages, and disadvantages. Conclusions are formed based on the criteria
- **Trade studies are used** to compare several products against a common set of requirements and criteria

The approaches: A **trade study**

- A trade study is a formal decision-making method that can be used to solve complex problems. Trade studies (also called tradeoff studies) are used to evaluate the design requirements and alternative designs. Trade studies are used throughout the development process to make cost-effective decisions

- Trade studies are used to:
  - rank user needs in order of importance
  - evaluate specifications
  - develop cost models
  - identify realistic configurations that meet user needs
  - make designs producible, testable, reliable, supportable
  - find manufacturable, testable, and maintainable configurations, with quality, cost and reliability at the required levels

  [Based on The Office of Naval Research's Best Manufacturing Practices Program "Expert System for Reducing Risk in the Transition from Development to Production". http://www.bmpcoe.org/]

The approaches: **Simulation**
What is a simulation and why do one?

- **A simulation is** a model that behaves or operates like a real or proposed system when provided a set of controlled inputs *[from IEEE Std 610.12-1990]*

- **A simulation is used to** understand the problems in a current system and to project the impact of proposed changes

The approaches: **Simulation**

- A simulation is usually used to model complex interactions that are difficult to observe empirically due to the cost or disruption that would occur.
- A simulation can be a powerful tool to illustrate a problem, and to evaluate a solution under different assumptions
- Simulations are most effective when based on real data

The approaches: **Competition**
What is a competition and why do one?

- **A competition is** a formal procurement process in which requirements are documented, and proposals to deliver products or services that purport to meet the requirements are submitted by competing firms

- **A competition is used to** choose which vendor or team of vendors will provide systems products or services

The approaches: **Competition**

- The competitive procurement process is intended to provide the best “bang for the buck” by inviting qualified bidders to submit proposals.
- The evaluation process involves examining the bidders’ technical and cost proposals.
- Competitive bidding is used when the contracting agency lacks the resources to complete the work more effectively than the bidders.
- The contracting agency still needs to define requirements clearly. If necessary, they may solicit outside help.

The approaches: **Prototype**
What is a prototype and why do one?

- **A prototype is** a development technique in which a preliminary version of part or all of the system is developed*[from IEEE Std 610.12-1990]*

- **A prototype is used to** get feedback from the users, determine feasibility, and investigate other issues in the proposed development
  [from IEEE Std 830-1993]

The approaches: **Prototype**

- A prototype is a quick trial implementation whose main purpose is to assess the feasibility of implementing one or more system requirements. The prototype may be discarded or further developed into a product.
- A prototype is used to refine requirements and display the behavior of the proposed system.

  [Based on SOFTWARE ENGINEERING PROCESS OFFICE (SEPO),CODE D13, NAVAL COMMAND, CONTROL, AND OCEAN SURVEILLANCE CENTER (NCCOSC), RESEARCH, DEVELOPMENT, TEST AND EVALUATION DIVISION (RDTE DIV), Software Management for Executives Guidebook, Version 1.4, May 2, 1997, 53560 HULL STREET, SAN DIEGO, CA 92152-5001]
- A prototype may require significant investment. The results of prototyping are usually clearer requirements and better communication between the users and developers. Sometimes, the prototype system can be used as the foundation for the production system.

So, what should Midland or your state do?

- Where are there choices to be made?
- What alternatives should they consider?
- How should they go about making decisions?

Midland's Problems . . . or yours

- Safety Assurance
  - A few carriers in 30% of all crashes
  - 11th in fatal large truck crashes
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  - Expand use of ASPEN
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  - Heavy traffic sometimes closes a few weigh stations
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  - Wide variety among carriers regarding use of technology
  - Many new carriers
  - Just-in-time deliveries

Recap & Questions

Objectives . . .

- Characterize Midland/your state
- Identify possible ITS/CVO technology applications in Midland/your state
- Identify alternatives for ITS/CVO technology choices

Any questions?